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FY 2006 NASA Research Announcement Awards for the Aeronautics Research Mission Directorate Updated June 26, 2007

Airspace Systems Program

The primary goal of the Airspace Systems Program (ASP) is to develop revolutionary concepts, capabilities, and technologies that will enable significant increases in the capacity, efficiency and flexibility of our National Airspace System (NAS). In pursuit of this goal, the ASP has aligned its portfolio to directly address the Air Traffic Management (ATM) research needs of the Next Generation Air Transportation System (NGATS) Initiative as defined by the multi-federal agency Joint Planning and Development Office (JPDO).

Consistent with NGATS capabilities, ASP will focus on two major NGATS ATM projects: Airspace and Airportal. The NGATS ATM Airspace Project will focus on developing capabilities in traffic flow management, dynamic airspace configuration, separation assurance, and airspace super density operations, which are supported by cross cutting technical areas of trajectory synthesis, prediction, and uncertainty, performance based services, and system-level design, analysis and simulation tools. The NGATS ATM Airportal Project will focus on developing airportal and terminal capabilities in three areas: safe and efficient surface operations, coordinated arrival/departure operations, and airportal transition and integration management. Research in the two projects will be integrated for gate-to-gate solutions.

NGATS ATM Airspace Project

The NGATS ATM-Airspace Project will develop and explore fundamental concepts and integrated solutions that address the optimal allocation of ground and air automation technologies necessary for the NGATS. The project will focus NASA's technical expertise and world-class facilities to address the question of where, when, how, and the extent to which automation can be applied to moving aircraft safely and efficiently through the NAS. Research in this project will address Four-Dimensional Trajectory Operations, including advances in the science and applications of multi-aircraft trajectory optimization that solves the demand/capacity imbalance problem while taking into account weather information and forecast uncertainties and keeping aircraft safely separated. The project's research will develop and test concepts for advanced traffic flow management to provide trajectory planning and execution across the spectrum of time horizons from "strategic planning" to "separation assurance." The project will also conduct research to explore dynamic airspace configuration that addresses the technical challenges of migrating from the current structured, static homogenous airspace to a dynamic, heterogeneous airspace that adapts to user demand and meets changing constraints of weather, traffic congestion, and a highly diverse aircraft fleet. Ultimately, the roles and responsibilities of humans and automation influence every technical area and will be addressed thoroughly.

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The following is a list of NRA awards made under the NGATS ATM – Airspace Project:

PI Last Name	Title	Organization	State	Award Date	Year 1 Amount
Bayen	A Unified Approach To Strategic Models And Performance Evaluation For Traffic Flow Mgmt	The Regents Of The University Of Ca-Berkeley	CA	9/30/2006	$330,787
Tomlin	Integrating Collision Avoidance And Tactical Air Traffic Control Tools	Stanford University	CA	9/30/2006	$506,685
Erzberger	Concepts And Algorithms For Automated Separation Assurance	The Regents Of The University Of Santa Cruz	CA	9/30/2006	$189,340
Corker	Computational Models Of Human Workload: Definition, Refinement, Integration, And Validation In Fast Time National Airspace Simulations	San Jose State University	CA	9/30/2006	$417,476
Strybel	Metrics For Operator Situation Awareness, Workload And Performance In Automated Separation Assurance Systems	Ca State University-Long Beach	CA	9/30/2006	$750,000
Clarke	Approaches To TFM In The Presence Of Uncertainty	Georgia Tech Research Corp	GA	9/30/2006	$360,980
Landry	Analysis And Development Of Strategic And Tactical Separation Assurance Algorithms	Purdue University	IN	9/30/2006	$103,185
Ball	Dynamic, Stochastic Models For Managing Air Traffic Flows	University Of Maryland	MD	9/30/2006	$727,586
Hansman	Cognitively Based Traffic Complexity Metrics for Future NGATS Concepts of Operation	Massachusetts Inst. Of Technology	MA	9/30/2006	$239,121
Hansman	Optimization Of Super-Density Multi-Airport Terminal Area System In The Presence Of Uncertainty	Massachusetts Inst. Of Technology	MA	9/30/2006	$450,527
Vivona	Development of Algorithms and Techniques for Trajectory Prediction Accuracy and Uncertainty Estimation	L-3 Communications Titan Corp.	MA	11/27/2006	$280,653
Idris	Traffic Complexity Management through Preserving Trajectory Flexibility and Minimizing Constraints	L-3 Communications Titan Corp.	MA	11/29/2006	$249,389
Sherry	Analysis Of NGATS Sensitivity To Gaming	George Mason University	VA	11/2/2006	$351,583
Krozel	Mitigation of Weather Impacts in Dense Terminal Airspace	Metron Aviation Inc.	VA	11/27/2006	$499,949
Roy	Control-Theoretic Design And Numerical Evaluation Of Traffic Flow Mgmt Strategies Under Uncertainty	Washington State University	WA	9/30/2006	$91,593

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Fundamental Aeronautics Program

The Fundamental Aeronautics Program is dedicated to the mastery of the principles of flight in any atmosphere at any speed. Physics-based, multidisciplinary design, analysis, and optimization (MDAO) tools will be developed that will make it possible to evaluate radically new vehicle designs and to assess, with known uncertainties, the potential impact of innovative technologies and concepts on a vehicle's overall performance. Advanced component technologies will be developed to realize revolutionary improvements in noise, emissions, and performance. The Program also supports the Agency's human and robotic exploration missions by advancing knowledge in aeronautical areas critical to Entry, Descent, and Landing (EDL).

The Program supports the goals of the NGATS and the JPDO by providing foundational research, prediction tools, and advanced technologies that can be used to both assess and reduce the noise and emission levels of current and future aircraft. Together with significant advances in aircraft performance (to reduce overall fuel consumption), these contributions can enable significant growth in the national air transportation system while meeting stringent environmental constraints.

The Program has four projects. The Subsonic Fixed Wing Project will address the challenge that future aircraft need to be quieter and cleaner to meet stringent noise and emissions regulations. These aircraft must also meet challenging performance requirements to make them economically viable alternatives to the existing fleet. The Subsonic Rotary Wing Project will address the technical barriers that constrain rotorcraft from reaching widespread use in civil aviation. These barriers include range, speed, payload capacity, fuel efficiency, and environmental acceptance. The Supersonics Project will conduct research to address the efficiency, environmental, and performance barriers to practical supersonic cruise, as well as the critical issue of supersonic deceleration to enable safe, precision planetary EDL of human and large science missions in any atmosphere. Because all access to space and all entry from space through any planetary atmosphere require hypersonic flight, the Hypersonics Project will tackle all of the key fundamental research issues required to make hypersonic flight and re-entry feasible.

Subsonic Fixed Wing Project

The goal of the Subsonic Fixed Wing project is to conduct long-term, cutting-edge research in the core competencies of the subsonic fixed wing regime, thereby producing knowledge, data, capabilities, technologies, and design tools at the foundational, discipline, multidiscipline and systems levels that will enable improved prediction methods and technologies for lower noise, lower emissions (including NOx, CO_2, water vapor, volatiles, unburned hydrocarbons, particulate matter, and soot), and higher performance for subsonic aircraft. Higher performance includes energy efficiency and operability technologies that enable advanced airframe and engine systems.

The project has identified the following key technical challenges that will be combined into higher level multi-disciplinary challenges: material science and mechanics of materials and structures; reacting flow physics; control methods and strategies; dynamic modeling and simulation; acoustics physics; aeroelasticity; computational methods; fluid dynamics and heat transfer; and new experimental methods and techniques.

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The following is a list of NRA awards made under the Subsonic Fixed Wing Project:

PI Last Name	Title	Organization	State	Award Date	Year 1 Amount
Wygnanski	Quantitative Identification of Physics Based Parameters Governing Active Separation and Circulation Control on Wings	University Of Arizona	AZ	1/18/2007	$201,000
Pitsch	Detailed Modeling of Combustion Noise Using a Combined Large-Eddy Simulation/Computational Aeroacoustics Model	Leland Stanford Junior University	CA	1/22/2007	$350,000
Guo	Development of the Next Generation of Airframe Noise Prediction Tools	Boeing Company	CA	2/5/2007	$108,000
Pitsch	Integrated Large Eddy Simulation of Multi-Phase Turbulent Reacting Flows for Realistic Gas-Turbine Combustors	Leland Stanford Junior University	CA	1/22/2007	$354,000
Meeks	Experimental and Modeling Studies of the Combustion Characteristics of Conventional and Alternative Jet Fuels	Reaction Design	CA	5/7/07	$601,000.00
Liscinsky	Effect of Particle Sampling Technique and Transport on Particle Penetration at the High Temperature and Pressure Conditions found in Gas Turbine Combustors and Engines	United Technologies Research Center	CT	1/26/2007	$279,000
Hussaini	High-Fidelity Numerical Simulations in Jet Aeroacoustics with Application to Chevron Nozzles	Florida State University	FL	1/20/2007	$116,000
Hussaini	High-Fidelity Numerical Simulations in Airframe Aeroacoustics	Florida State University	FL	1/22/2007	$100,000
Sheplak	IShear-Stress Sensor Array Measurement Technology for the Support of Turbulence Model Development for Flow Separation	University Of Florida	FL	1/3/2007	$153,000
Cattafesta	Development Of Advanced Zero-Net Mass-Flux Actuators	University Of Florida	FL	3/19/07	$711,000
Menon	Subgrid Combustion Models for the Next Generation National Combustion Code	Georgia Institute Of Technology	GA	11/20/2006	$100,000
Englar	Circulation Control Aerodynamics for Very Efficient High-Lift and Cruise Performance of Subsonic/Transonic Air Vehicles	Georgia Institute Of Technology	GA	12/21/2006	$283,000
Durbin	Turbulence Models for Flow Separation	Iowa State University	IA	12/4/2006	$115,000

Davis	Basic Studies for the Production and Upgrading of Fisher-Tropsch Synthesis Products to Fuels	University Of Kentucky	KY	1/22/2007	$481,000
Spakovszky	Noise Reduction Concepts for Highly-Integrated Propulsion Systems with Inlet Flow Distortion	Massachusetts Institute of Technology	MA	5/2/07	$505,000
Volino	Flow Control Under Low-Pressure Turbine Conditions Using Pulsed Jets	US Naval Academy	MD	1/30/2007	$93,000
Vander Wal	Electron Microscopy, Spectroscopy and Chemical Analysis of Aircraft Engine Particulate (solid and volatile) for Complete Physical and Chemical Characterization	Universities Space Research Association	MD	1/3/2007	$128,000
Simon	Separation control using plasma actuators on low pressure turbine airfoils with passing wakes: experiments and modeling	University of Minnesota	MN	1/26/2007	$263,000
Miles	Plasma Actuators for Turbomachinery Flow Control	Princeton University	NJ	1/21/2007	$300,000
Sung	Comprehensive Chemical Kinetics of Conventional and Alternative Jet Fuels for Aeropropulsion Combustion Modeling	Case Western Reserve University	OH	11/21/2006	$149,000
Gutmark	POD and LSE Analysis of Simultaneous Measurements of Velocity Near Field Pressure, and Temperature Fluctuations in Coaxial High Subsonic Jet Flow	University Of Cincinnati	OH	1/21/2007	$226,000
Modest	LES Modeling of Spectral Multiphase Radiation and Turbulence/Chemistry/ Radiation Interactions in Reacting Turbulent Flow	Pennsylvania State University	PA	12/19/2006	$197,000
Girimaji	RANS and Variable-Resolution PANS Models for Separated Flows	Texas Engineering Experiment Station	TX	11/29/2006	$189,000
Lagoudas	Multi-Scale Modeling and Characterization of Carbon Nanotube Reinforced Multi-Functional Composites as New Lightweight, Durable Materials for Improved Subsonic, Fixed-Wing Vehicle Performance	Texas Engineering Experiment Station	TX	1/25/2007	$150,000
Karaman	Thermomechanical Processing and Modeling of High Temperature SMAs for Multifunctional Engine Components	Texas Engineering Experiment Station	TX	11/27/2006	$149,000
Simon	Novel Nanoparticle-Filled Matrices for Thermal Stress Reduction in Polymer Matrix Composites: Multi-Scale Modeling and Experimental Validation	Texas Tech University System	TX	1/20/2007	$150,000
Bons	A Holistic Approach To Flow Control For Turbomachinery Blading: Endwall And Mid-Span	Brigham Young University	UT	1/30/2007	$90,000
Dunn	Fast Scattering Code Development	Mark Dunn	VA	1/24/2007	$315,000

Dougherty	Improving Phased Array Techniques to Account for Extended Sources of Fan and Jet Noise	Optinav Inc.	WA	2/5/2007	$175,000
Hershkowitz	Dielectric barrier discharge plasma actuators with novel geometries for subsonic flow modification: Experimental measurements with development and validation of a 2-D fluid model	University Of Wisconsin System	WI	1/3/2007	$168,000

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Subsonic Rotary Wing Project

The goal of the Subsonic Rotary Wing project is to conduct long-term, cutting-edge research in the core competencies of the subsonic rotary wing regime, thereby producing knowledge, data, capabilities, technologies, and design tools at the foundational, discipline, multidiscipline and systems levels that will enable improved prediction methods and technologies for lower noise, lower emissions, and higher performance for rotary wing aircraft. Higher performance includes improved speed, range, payload capacity, propulsion efficiency, and control systems for safe operations. Advances in physics-based prediction capability will ultimately lead to a more robust ability to develop rotorcraft vehicles that fly as designed.

The specific objectives of the research are driven by five key technical challenge areas: power transmission and generation; control theory and information processing and modeling; fluid mechanics, dynamics, and aero-structural coupling; acoustics physics; and solid mechanics and advanced materials. These technical challenges are relevant to a broad range of industry and government programs, inherently force the integration of multiple disciplines, and involve technical issues that are beyond the reach of current prediction tools. Each of the technical challenges brings together the analytical methods and experimental validation data that are required to advance the state-of-the-art in a multi-discipline environment. Innovative solutions to these technical challenges, coupled with the increased ability to predict with certainty the solutions, will drive breakthrough technology for the rotorcraft industry.

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The following is a list of NRA awards made under the Subsonic Rotary Wing Project:

PI Last Name	Title	Organization	State	Award Date	Year 1 Amount
Chang	Crashworthiness Analysis of Composite Structures	Leland Stanford Junior University	CA	1/27/2007	$122,507
Glezer	Combustion Powered Actuators (COMPACT) for Aerodynamic Flow Control on Rotorcraft Blades	Georgia Tech Research Corp.	GA	12/21/2006	$210,274
Ruzzene	Control of Vibration Transmission and Interior Noise Radiation of Composite Shells with Embedded Passive and Active Periodicity	Georgia Tech Research Corp.	GA	1/12/2007	$100,199
Chopra	Detailed Performance, Wakes, Pressures and Loads for High Speed Single and Coaxial Rotors	University of Maryland – College Park	MD	1/25/2007	$310,001
Schmitz	Fundamental Acoustic Design Tool Development and Validation for Rotorcraft External Noise	University of Maryland, College Park	MD	1/25/2007	$250,390
Schmitz	A Helicopter Tip-Path-Plane Measurement System Using an Optics-Based Method	University of, College Park Maryland	MD	1/25/2007	$178,527
Vlahopoulos	EFEA developments for metallic/composite rotorcraft configurations	University of Michigan	MI	1/12/2007	$150,000
Tabakoff	A Study of Thermal Barrier Coating Erosion in Rotorcraft Engine	University of Cincinnati	OH	1/12/2007	$177,000
Kunz	High Fidelity CFD Analysis & Validation of Rotorcraft Gear Box Aerodynamics Under Operational & Oil-Out Conditions	Pennsylvania State University	PA	1/9/2007	$200,000
Wang	Comprehensive Modeling & Analysis of Rotorcraft Variable Speed Propulsion System with Coupled Engine/Transmission/ Rotor Dynamics	Pennsylvania State University	PA	12/21/2006	$221,000
Anusonti-Inthra	Integrated Algorithms for High-Fidelity Rotorcraft Aeromechanics Predictions within CFD/CSD-Coupled Frameworks	National Institute of Aerospace Associates	VA	2/5/2007	$130,000
Liu	Multidisciplinary Computational Tool for Accurate and Efficient Rotorcraft Noise Prediction (MUTE)	National Institute of Aerospace Associates	VA	2/5/2007	$175,000

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Supersonics Project

The goal of the Supersonics project is to conduct long-term, cutting-edge research in the core competencies of the supersonic regime, thereby producing knowledge, data, capabilities, technologies, and design tools at the foundational, discipline, multidiscipline and systems levels that will address the technical challenges for two supersonic vehicle classes: practical supersonic cruise vehicles and High Mass Mars Entry Systems.

The project is organized along the following major technical challenges that have been identified for the two vehicle classes: efficiency (supersonic cruise, light weight and durability at high temperature); environmental challenges (airport noise, sonic boom, high altitude emissions); performance challenges (aero-propulso-servo-elastic analysis and design); entry descent and landing challenges (supersonic deceleration); and multidisciplinary design, analysis and optimization challenges.

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The following is a list of NRA awards made under the Supersonics Project:

PI Last Name	Title	Organization	State	Award Date	Year 1 Amount
Fasel	Transition in High-Speed Boundary Layers: Numerical Investigations using DNS and LES	University Of Arizona	AZ	1/27/2007	$199,000
Roy	Life Prediction Of Composite Materials Subjected To Long-Term Mechanical/Environmental Loading Conditions	The University Of Alabama	AL	1/5/2007	$141,000
Tippur	Investigation Of Strain-Rate Effects On Crack Growth In Graphite-Epoxy Composites With Stiffeners	Auburn University	AL	12/21/2006	$174,000
Papamoschou	Supersonic Jet Noise Reduction Via Reshaping Of The Exhaust Plume	University Of California (Irvine Campus)	CA	1/16/2007	$213,000
Pitsch	Emissions Prediction And Modeling Of Supersonic Vehicle Combustion Systems	Leland Stanford Junior University	CA	1/20/2007	$343,000
Lele	Prediction And Modeling Of Supersonic Jet Noise Using Large-Eddy Simulation	Leland Stanford Junior University	CA	1/27/2007	$326,000
Fotache	Validated Computational Tools For Low Emissions Injector Design Using Superheated/Supercritical Fuels	United Technologies Research Center	CT	1/26/2007	$294,000
Seitzman	Detection And Control Of Instabilities And Blowoff For Low Emissions Combustors	Georgia Tech Research Corp	GA	1/16/2007	$256,000
Loth	SBLI Flow Control With Micro-VG'S Using LES	University Of Illinois	IL	1/20/2007	$84,000
Lucht	Coherent Anti-Stokes Raman Scattering (CARS) For Quantitative Temperature And Concentration Measurements In A High-Pressure Gas Turbine Combustion Test Rig	Purdue University	ID	1/25/2007	$273,000
Darmofal	Development And Application Of A Higher-Order, Adaptive Method For Aerodynamic And Sonic-Boom Design Of Supersonic Aircraft	Massachusetts Institute Of Technology	MA	12/22/2006	$296,000
Loos	Modeling The Vacuum Assisted Resin Transfer Molding Process For Fabrication Of Fiber/Metal Hybrid Laminates	Michigan State University	MI	1/25/2007	$116,000
Kojima	Time-Resolved Laser Raman Spectroscopy For Scalar Measurements Of Swirl-Stabilized Liquid-Fueled Combustion At Elevated Pressures And Temperatures: Toward Combustion Code Validation	Ohio Aerospace Institute	OH	1/20/2007	$141,000
Samimy	Supersonic Jet Noise Suppression Using Plasma Actuators: Coupled Experiments, Les And Adjoint-Based Optimization	The Ohio State University Research Foundation	OH	1/29/2007	$281,000
Tewari	Strain-Tolerant Self-Sensing Environmental Barrier Coatings For SiC/SiC Ceramic Matrix Composites And Si3N4 Ceramics	Cleveland State University	OH	1/27/2007	$205,000
Santavicca	Active Combustion Control For Supersonic Low Emission Combustors	The Pennsylvania State University	PA	1/20/2007	$320,000

Morris	A Comprehensive Model For The Prediction Of Supersonic Jet Noise	The Pennsylvania State University	PA	1/20/2007	$232,000
Karman	A Generalized Framework for Constrained Design Optimization of General Supersonic Configurations Using Adjoint Based Sensitivity Derivatives	The University Of Tennessee	TN	1/31/2007	$205,000
Bogard	Experimental Measurements And Computational Predictions Of Conjugate Heat Transfer In A Stationary Cooled Turbine Vane	University Of Texas At Austin	TX	1/20/2007	$264,000
Collier	A Multiscale, Validated, Physics-Based Progressive Failure Modeling Tool For Advanced Composite Structures	Collier Research And Development Corporation	VA	1/31/2007	$236,000

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Hypersonics Project

The Hypersonics Project is motivated by the fact that all access to Earth or planetary orbit, and all entry from orbit into Earth's atmosphere or any planet with an atmosphere, requires flight through the hypersonic regime. The goal of the project is to conduct long-term, cutting-edge research in the core competencies of the hypersonic regime, thereby producing knowledge, data, capabilities, and design tools at the foundational, discipline, multidiscipline and systems levels that will address the technical challenges for two high-payoff NASA-unique missions: Highly Reliable Reusable Launch Systems and High Mass Mars Entry Systems.

Cutting-edge hypersonics research for Highly Reliable Reusable Launch Systems will enable sustained hypersonic flight through the atmosphere and can help the Department of Defense achieve its goal of reaching targets from the air with global reach, quick reaction, persistence, and significant payload. The research focused on High Mass Mars Entry Systems will result in the development of technologies and concepts that can enable the safe and accurate delivery of large payloads to the surface of Mars. This effort will facilitate the EDL phase of both human and robotic planetary missions and is closely aligned with the long-term goals of NASA's Vision for Space Exploration.

The project will focus its research on solving some of the hardest challenges in hypersonics such as the development of materials for airframe and propulsion applications that can withstand severe temperatures; the development of predictive models for compressible flow, turbulence, heating, ablation, and combustion; the creation of advanced control techniques for vehicles that fly in the hypersonic flow regime; and the generation of new experimental techniques that can be used to validate our theoretical and computational models. In addition, the project will work towards realizable propulsion systems that integrate high-speed turbine engines and scramjets, and will tie together all of the interactions among the airframe, inlet, nozzle, and propulsion systems using a Physics-Based MDAO approach.

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The following is a list of NRA awards made under the Hypersonics Project:

PI Last Name	Title	Organization	State	Award Date	Year 1 Amount
Legzdina	Optimization of Creep and Fatigue Resistance of Near Alpha Titanium alloys by Utilizing Beta Processing Route	Honeywell International, Inc.	AZ	1/9/2007	$120,000
Rodriguez	Robust Hierarchical Control (Hi-C) for Future Hypersonic Vehicles with Aero-Thermo-Elastic-Propulsion Interactions	Arizona State University	AZ	1/23/2007	$189,000
Eldredge	Numerical Investigations of Transitional and Turbulent Flow Physics in Hypersonic Boundary Layers	University of California	CA	1/19/2007	$150,000
Yang	Low-Cost Manufacturing of C/ZrC Composites using Melt Infiltration/Reaction Approach for Ultrahigh Temperature TPS Applications	University of California	CA	1/19/2007	$150,000
Shaqfeh	High Fidelity Simulations Tools for Space Exploration Vehicles	Leland Stanford Junior University	CA	1/25/2007	$200,000
Huo	Chemical reaction and electron-impact excitation rates for direct numerical simulations and radiation transport modeling in the hypersonic regime	HUO Consulting LLC	CA	1/25/2007	$114,000
Hanson,	Hypersonic Mass-flux Sensing with Fiber-Coupled Tunable Diode Lasers for Ground Test Applications and Flight Evaluation	Leland Stanford Junior University	CA	1/25/2007	$150,000
Cutler	Simultaneous Dual-broadband CARS and Interferometric Rayleigh Scattering	The George Washington University	DC	1/26/2007	$256,000
Lind	Multi-Loop Adaptive Control of Aerothermoelastic Dynamics	University of Florida	FL	1/23/2007	$205,000
Schneider	Towards Mechanism-Based Models for Laminar-Turbulent Transition on a Representative Airbreathing Forebody: Mach-6 Quiet-Tunnel Experiments	Purdue University	ID	1/25/2007	$100,000
Powers	Advanced Multi-Scale Computational Methods for Hypersonic Propulsion	University of Notre Dame DU LAC	ID	1/23/2007	$116,000
Vogel	FADS-based Reconfigurable Control and Health Monitoring for Hypersonic Vehicles	Vibroacoustics Solutions Inc.	IA	1/31/2007	$201,000
Annaswamy	Adaptive Robust Control for Hyp Vehicles (ARCH)	Massachusetts Institute of Technology	MA	1/23/2007	$177,000
Hamner	Adaptation of Temperature and Pressure Sensitive Paint Technology for Basic Hypersonic Research	LeaTech, LLC	MA	1/31/2007	$92,000
Jaberi	A high fidelity model for numerical simulation of complex combustion and propulsion systems	Michigan State University	MI	1/25/2007	$155,000

Candler	Advanced Aerothermodynamics Simulation Tools for HMMES Design and Optimization	University of Minnesota	MN	1/19/2007	$170,000
MacLean	Measuring Wake Flows on Capsule Bodies	CALSPAN-UB Research Center, Inc.	NY	1/26/2007	$171,000
Xu	Adaptive Identification and Control for Nonlinear Aerospace Systems by Multi-Parameter Regularization	Syracuse University	NY	1/19/2007	$103,000
Edwards	Development of Hybrid Large-Eddy / Reynolds-Averaged Navier-Stokes Methods for High-Speed Internal Flows	North Carolina State University	NC	1/17/2007	$170,000
Wu	Reconfigurable robust gain-scheduled control for air-breathing hypersonic vehicles	North Carolina State University	NC	1/23/2007	$157,000
Adamovich	Nonequilibrium ignition and flame holding in high speed reacting flows	Ohio State University	OH	1/30/2007	$170,000
Lempert	Development of MHz frame rate optical diagnostics for hypersonic ground test facilities	Ohio State University	OH	1/30/2007	$244,000
Sullivan	Integrated Durability Model for Ceramic Matrix Composite Components	Materials Research & Design Inc.	PA	1/31/2007	$150,000
Santoro	Performance Studies of the Ejector Mode of an Unsteady Pulse Detonation RBCC Engine	Penn State University	PA	1/26/2007	$220,000
Levin	Coupled nonequilibrium flow, energy and radiation transport of hyper planetary entry	Penn State University	PA	1/29/2007	$198,000
Dunfey	Design, Fabrication, and Testing of Load-Bearing TPS	Materials Research & Design	PA	12/27/2006	$150,000
Bhattacharya	Robust Adaptive Guidance for High Mass Entry, Descent and Landing at Mars	Texas Engineering Experiment Station	TX	1/19/2007	$175,000
Przekop	Probabilistic Analysis and Design Tools for High-Cycle Fatigue Resistant Hypersonic Vehicle Structures	National Institute Of Aerospace Associates	VA	1/30/2007	$98,000
Goyne	Test Media Effects on DMSJ Mode-Transition	University of Virginia	VA	1/20/2007	$225,000
Zhigilei	Multiscale Computational Model for Multifunctional Nanocomposite Ablator Materials	University of Virginia	VA	1/26/2007	$208,000
McDaniel	Combustion Efficiency Measurement for Ground Test and Basic Hypersonic Research	University of Virginia	VA	1/23/2007	$199,000
Holton	Protected, High Temperature Optical Fiber Sensors, Gauge Elements and Systems	Virginia Polytechnic Institute & State University	VA	1/23/2007	$157,000
Chelliah	Reduced Reaction Models for Hypersonic Reacting Flow Simulations: Model Development and Validation Study	University of Virginia	VA	1/23/2007	$144,000
Mangalam	High-Sensitivity Heat Flux Gage for Calibrated Heat Transfer Measurements	TAO Systems Integration, Inc.	VA	1/17/2007	$198,000

Mavriplis	High Order Spatial and Temporal Methods for Simulation and Sensitivity Analysis of High-Speed Flows	University of Wyoming	WY	1/19/2007	$150,000

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Aviation Safety Program

The Aviation Safety Program will provide aircraft safety related concepts, tools, and technologies that will help ensure the safety of the U.S. Air Transportation System as it transitions to meet the future needs of the NGATS. These needs include the anticipated significant increases in air traffic; increased reliance on automation; increased diversity of air vehicles; and increased complexity in the system. The long range goals of the research include reduced occurrence of in-flight failures; onboard systems capable of self-correcting anomalies; improved crew workload allocation and situation awareness; and advanced flight controls to ensure flight safety during adverse flight conditions. In addition, the Aviation Safety Program technologies can be leveraged to improve the resilience of future space vehicles against the hazards of long duration space travel as well as operations in harsh and/or remote environments.

The Aviation Safety Program has four projects. The Integrated Vehicle Health Management Project addresses the challenge of integrating, processing, and effectively using large amounts of information across highly integrated and complex flight critical systems. The Aircraft Aging and Durability Project addresses the challenge of improving the operational resiliency of future structures and advanced materials. The Integrated Intelligent Flight Deck Project addresses the challenge of ensuring the proper integration of the human operator in a highly automated and complex operational environment. The Integrated Resilient Aircraft Control Project addresses the challenge of providing onboard control resilience to ensure safe flight in the presence of adverse conditions.

Integrated Vehicle Health Management Project

The Integrated Vehicle Health Management (IVHM) Project will conduct research to advance the state of highly integrated and complex flight-critical health management technologies and systems. These technologies will enable nearly continuous onboard situational awareness of the vehicle health state for use by the flight crew, ground crew, and maintenance depot. Improved safety and reliability will be achieved by onboard systems capable of performing self-diagnostics and self-correcting of anomalies that could otherwise go unattended until a critical failure occurs. A key enabling technology will be the ability for sharing and processing large amounts of information among the various vehicle subsystems to more accurately diagnose the system health state and execute the logic to self-correct any critical anomalies detected. Because of the potential broad applications for the IVHM products to include commercial, military, and space vehicle, ARMD will be working with the FAA, DOD, and the NASA space directorates to develop these technologies.

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The following is a list of NRA awards made under the IVHM Project:

PI Last Name	Title	Organization	State	Award Date	Year 1 Amount
Chattopadhyay	An Integrated Vehicle Health Management Approach to Heterogeneous Structural Systems	Arizona State University	AZ	1/29/2007	$216,901
Boyd	Robust Optimal Estimation of Hybrid System States for Diagnosis and Prognosis of Aircraft Systems	Stanford University	CA	1/26/2007	$162,493
Manolios	Hierarchical Component-Based Framework for the Formal Verification and Validation of Complex Aerospace Software Systems	Georgia Institute of Technology	GA	1/31/2007	$299,752
Chen	Packaging Technology for High Temperature SiC Electronics and Sensors	Ohio Aerospace Institute	OH	1/26/2007	$159,999
Ray	Health State Assessment and Failure Prognosis of Integrated Aircraft Propulsion	Pennsylvania State University	PA	1/29/2007	$149,557
Biswas	Online Statistical Methods for Robust State Estimation, Anomaly Detection, and Degradation Analysis in Complex, Embedded Systems	Vanderbilt University	TN	1/2/2007	$249,956
Ranaudo	Real Time Methods to Reduce Inflight Icing Hazards	University of Tennessee Space Institute	TN	1/30/2007	$288,888
Gray	Design and Analysis of Recoverable Flight Control Systems for Harsh Environments via the SPIDER Architecture	Old Dominion University	VA	1/30/2007	$238,621

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Aircraft Aging and Durability Project

The Aircraft Aging and Durability (AAD) Project will develop advanced diagnostic and prognostic capabilities for detection and mitigation of aging-related hazards. The research and technologies to be pursued will decrease the susceptibility of current and next generation aircraft and onboard systems to premature deterioration, thus greatly improving vehicle safety and mission success. Emerging civilian and military aircraft are introducing advanced material systems, fabrication techniques, and structural configurations for which there is limited service history. There will be an emphasis in the AAD project on new material systems/fabrication techniques and the potential hazards associated with aging-related degradation. The intent is to take a proactive approach to identifying aging-related hazards before they become critical, and to develop technology and processes to incorporate aging mitigation into the design of future aircraft. Foundational research in aging science will ultimately yield Multidisciplinary Design, Analysis, and Optimization (MDAO) capabilities that will enable system-level integrated methods for detection, prediction, and mitigation/management of aging-related hazards for future civilian and military aircraft. Because of the potential broad applications for the AAD products to include commercial, military, and space vehicles, ARMD will be working with the FAA, DOD, and the NASA space directorates to develop these technologies.

As of 26 Jun 2007
The following is a list of NRA awards made under the AAD Project:

PI Last Name	Title	Organization	State	Award Date	Year 1 Amount
Jou	Application of Computational Materials Design Technology and Accelerated Insertion of Materials Methodology to the Microstructure Modeling of Dual Microstructure Heat-Treated Nickel-Based Turbine Disk Alloys Under Processing and Service Conditions	QuesTek Innovations LLC	IL	12/4/2006	124,982
Lissenden	Nondestructive Evaluation of Polymer-Matrix Composites and Joints Using Ultrasonic Guided Waves	Pennsylvania State University	PA	1/31/2007	113,940.00
Ingraffea	Multi-Scale Simulation of Cracking Processes in Metallic Materials	Cornell University	NY	1/31/2007	122,753
Gregory	Semi-conductive Oxides for High Temperature Thin Film Sensors Applications	Univ. of Rhode Island	RI	10/1/2006	102,340
Sutton	Prediction of Stable Tearing Along Arbitrary 3D Crack Surfaces in Metallic Structures: Criteria validation and Crack Path Predictions under Mixed Mode Loading	Univ. of South Carolina	SC	1/17/2007	150,000
Schreier	Quantifying Deformations on the Microscale: Development of a SEM-Based Measurement System with Software Implementation Capable of Measuring Crack Tip Strains	Correlated Solutions, Inc.	SC	1/31/2007	149,997
Kelly	First-Principles Calculations of the Structure and Energetics of Al/Water Interfaces of Relevance to Corrosion and Fatigue	University of Virginia	VA	12/22/2006	143,178

As of 26 Jun 2007

Integrated Intelligent Flight Deck Project

The Integrated Intelligent Flight Deck (IIFD) Project will pursue flight deck related concepts and technologies that will ensure crew workload and situation awareness are both safely optimized and adapted to the future operational environment as envisioned by the NGATS. A key component of this research will be investigating methods to automatically monitor, measure, and assess the state of crew awareness. The scope of IIFD includes the following: development of crew/vehicle interface technologies that reduce the risk of pilot error; development of monitoring technologies to enable detection of unsafe behaviors; development of fail-safe methods for changing the operator/automation roles in the presence of detected disability states; and development of a comprehensive surveillance system design that enables robust detection of external hazards with sufficient time-to-alarm for safe maneuvering to avoid the hazards. The products of the IIFD Project should enable system designers to eliminate the safety risk of unintended consequences when introducing new and advanced systems into an operational environment. Because of the potential broad applications for the IIFD products to include commercial, military, and space vehicles, ARMD will be working with the FAA, DOD, and the NASA space directorates to develop these technologies.

The following is a list of NRA awards made under the IIFD Project:

PI Last Name	Title	Organization	State	Award Date	Year 1 Amount
Pritchett	Methodology to support Dynamic Function Allocation Policies bet/Humans and Flight Deck Automation	Georgia Tech Research Corp.	GA	9/28/2006	$140,000
Kaber	Testing & Validation of a Psychologically defined Metric of Display Cluster	North Carolina State University	NC	9/28/2006	$130,601
White	Characterization of Airborne Runway Incursion Sensors	Research Triangle Institute	NC	12/4/2006	$138,075
Schnell	Operator State Sensor Investigations and Operator State Classification and Feedback Algorithms*	University of Iowa	IA	11/1/2006	$251,559
Rahman	Smart Sensor Processing for Automatic Runway Hazard Detection	Old Dominion Univ.	VA	12/4/2006	$165,000